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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/646,897	08/22/2003	Warren M. Farnworth	01-1059.1	1324

22823 7590 11/21/2006

STEPHEN A GRATTON  
THE LAW OFFICE OF STEVE GRATTON  
2764 SOUTH BRAUN WAY  
LAKEWOOD, CO 80228

EXAMINER

LEWIS, MONICA

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 11/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/646,897	<b>Applicant(s)</b> FARNWORTH ET AL.	
	<b>Examiner</b> Monica Lewis	<b>Art Unit</b> 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 14 September 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 170-179 and 262-272 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 170-179 and 262-272 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/06/9/06</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. This office action is in response to the amendment filed September 14, 2006.

#### ***Response to Arguments***

2. Applicant's arguments with respect to claims 170-179 and 262-272 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Specification***

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 170, 174-177, 262, 263, 265-267 and 270 are rejected under 35 U.S.C. 103(a) as obvious over Wakabayashi et al. (U.S. Patent No. 6,607,970) in view of Kinsman et al. (U.S. Patent No. 6,717,245) and Farnworth et al. (U.S. Patent No. 6,620,731).

In regards to claim 170, Wakabayashi discloses the following:

a) a semiconductor die (1) having an outline, circuit side, a back side, four peripheral edges, and a plurality of die contacts on the circuit side (For Example: See Figure 15);

b) a plurality of contact bumps (6) on the die contacts (For Example: See Figure 15);

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c) a first polymer layer (13) covering the circuit side, the contact bumps and the peripheral edges, the first polymer layer having edge polymer layers covering the peripheral edges (For Example: See Figure 15); and

d) a second layer (17) covering the back side, the first polymer layer and the second polymer layer encapsulating the die on six sides such that the component has a chip scale outline corresponding to the outline of the die plus the edge polymer layers (For Example: See Figure 15).

In regards to claim 170, Wakabayashi fails to disclose the following:

a) a thinned die.

However, Farnworth et al. ("Farnworth") discloses a semiconductor device that has a thinned die (For Example: See Column 8 Lines 61-67). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include a thinned die as disclosed in Farnworth because it aids in exposing conductive members (For Example: See Column 8 Lines 61-67).

Additionally, since Wakabayashi and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Wakabayashi.

b) a plurality of terminal contacts on the contact bumps.

However, Kinsman et al. ("Kinsman") discloses a semiconductor device that has a plurality of terminal contacts (32) on the contact bumps (20) (For Example: See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include a plurality of terminal contacts on the contact bumps as disclosed in Kinsman because it aids in providing external connections (For Example: See Column 5 Line 10).

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Additionally, since Wakabayashi and Kinsman are both from the same field of endeavor, the purpose disclosed by Kinsman would have been recognized in the pertinent art of Wakabayashi.

c) planarized polymer material rigidifying the peripheral edges.

However, Kinsman discloses a semiconductor device where the planarized polymer material is in a rigid state (For Example: See Column 6 Lines 20-25). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include planarized polymer material in a rigid state as disclosed in Kinsman because it aids in providing the ability to expose conductive elements (For Example: See Column 6 Lines 19-25).

Additionally, since Wakabayashi and Kinsman are both from the same field of endeavor, the purpose disclosed by Kinsman would have been recognized in the pertinent art of Wakabayashi.

Finally, the following limitation makes it a product by process claim: a) "planarized." The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re*

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*Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claim 174, Wakabayashi discloses the following:

a) the first polymer layer and the contacts bumps have a same planar surface (For Example: See Figure 15).

In regards to claim 175, Wakabayashi discloses the following:

a) the second polymer layer covers edges of the edge polymer layers (For Example: See Figure 15).

In regards to claim 176, Wakabayashi fails to disclose the following:

a) a plurality of conductive vias in the thinned die electrical in communication with the die contacts and with the terminal contacts.

However, Farnworth discloses a semiconductor device that utilizes a plurality of conductive vias (30) in the die electrical communication with contacts (38) (For Example: See Figures 1A-1G and Column 4 Lines 1-4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include a plurality of conductive vias as disclosed in Farnworth because it aids in providing electrical communication between the integrated circuit and the contacts (For Example: See Abstract).

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Additionally, since Wakabayashi and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Wakabayashi.

In regards to claim 177, Wakabayashi fails to disclose the following:

a) a plurality of second die contacts on the second polymer layer in electrical communication with conductive vias.

However, Farnworth discloses a semiconductor device that has a plurality of second die contacts (40) on the second polymer layer (22) in electrical communication with conductive vias (30) (For Example: See Figures 1A-1G). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include a plurality of contacts on the polymer layer as disclosed in Farnworth because it aids in providing electrical communication between the integrated circuit and the contacts (For Example: See Abstract).

Additionally, since Wakabayashi and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Wakabayashi.

In regards to claim 262, Wakabayashi discloses the following:

a) the contact bumps comprise planarized surfaces (For Example: See Figure 15).

In regards to claim 263, Wakabayashi discloses the following:

a) the backside comprises a polished surface (For Example: See Abstract).

Finally, the following limitation makes it a product by process claim: a) "polished surface." The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The

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patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claim 265, Wakabayashi fails to disclose the following:

a) the first polymer layer on each edge comprises a portion of a polymer filled trench.

However, Kinsman discloses a semiconductor device that has a polymer filled trench (26) (For Example: See Figure 1D). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include a polymer filled trench as disclosed in Kinsman because it aids in providing hermetic sealing (For Example: See Column 6 Lines 38-41).

Additionally, since Wakabayashi and Kinsman are both from the same field of endeavor, the purpose disclosed by Kinsman would have been recognized in the pertinent art of Wakabayashi.

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In regards to claim 266, Wakabayashi discloses the following:

a) the edge polymer layers and the back side have a same planar surface (For Example: See Figure 15).

In regards to claim 267, Wakabayashi discloses the following:

a) the edge polymer layers have a selected thickness which is different than a thickness of the first polymer layer (For Example: See Figure 15).

In regards to claim 270, Wakabayashi discloses the following:

a) the first polymer layer comprises a first polymer material and the second polymer layer comprises a second polymer material (For Example: See Column 3 Lines 64-65 and Column 5 Lines 32-33).

6. Claims 171 and 268 are rejected under 35 U.S.C. 103(a) as obvious over Wakabayashi et al. (U.S. Patent No. 6,607,970) in view of Kinsman et al. (U.S. Patent No. 6,717,245), Farnworth et al. (U.S. Patent No. 6,620,731) and Beffa et al. (U.S. Patent No. 6,233,185).

In regards to claim 171, Wakabayashi fails to disclose the following:

a) the die comprises a tested and burned in die and the component comprises a known good component (KGC).

However, Beffa et al. ("Beffa") discloses a semiconductor device that has a die that comprises a tested and burned in die and the component comprises a known good component (For Example: See Column 1 Lines 9-12). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include a die that comprises a tested and burned in die and the component comprises a known good component as disclosed in Beffa because it aids in determining which die is functional (For Example: See Column 1 Lines 30-32).

Additionally, since Wakabayashi and Beffa are both from the same field of endeavor, the purpose disclosed by Beffa would have been recognized in the pertinent art of Wakabayashi.

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In regards to claim 268, Wakabayashi fails to disclose the following:

- a) the thinned die comprises a tested and burned in die.

However, Beffa discloses a semiconductor device that has a die that comprises a tested and burned in die (For Example: See Column 1 Lines 9-12). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include a die that comprises a tested and burned in die as disclosed in Beffa because it aids in determining which die is functional (For Example: See Column 1 Lines 30-32).

Additionally, since Wakabayashi and Beffa are both from the same field of endeavor, the purpose disclosed by Beffa would have been recognized in the pertinent art of Wakabayashi.

7. Claims 172, 173, 264 and 265 are rejected under 35 U.S.C. 103(a) as obvious over Wakabayashi et al. (U.S. Patent No. 6,607,970) in view of Kinsman et al. (U.S. Patent No. 6,717,245), Farnworth et al. (U.S. Patent No. 6,620,731) and Farnworth et al. (U.S. Patent No. 6,097,087).

In regards to claim 172, Wakabayashi discloses the following:

- a) the contact bumps comprise metal bumps in a dense array.

However, Farnworth et al. ("Farnworth") discloses a semiconductor device that has a bumps in a dense array (For Example: See Column 1 Lines 30-36). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include bumps in a dense array as disclosed in Farnworth because it aids in permitting high input/output capability (For Example: See Column 1 Lines 31-37).

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Additionally, since Wakabayashi and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Wakabayashi.

In regards to claim 173, Wakabayashi discloses the following:

- a) the terminal contacts comprise conductive bumps or balls in a grid array.

However, Farnworth discloses a semiconductor device that has terminal contacts in a grid array (For Example: See Column 1 Lines 30-36). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include terminal contacts in a grid array as disclosed in Farnworth because it aids in permitting high input/output capability (For Example: See Column 1 Lines 31-37).

Additionally, since Wakabayashi and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Wakabayashi.

In regards to claim 264, Wakabayashi discloses the following:

- a) the second polymer layer comprises a tape material.

However, Farnworth discloses a semiconductor device that has tape material (For Example: See Column 1 Lines 25-37). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include tape material as disclosed in Farnworth because it aids in providing flexible material (For Example: See Column 1 Lines 25-37).

Additionally, since Wakabayashi and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Wakabayashi.

In regards to claim 265, Wakabayashi fails to disclose the following:

a) the first polymer layer on each edge comprises a portion of a polymer filled trench.

However, Kinsman discloses a semiconductor device that has a polymer filled trench (26) (For Example: See Figure 1D). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include a polymer filled trench as disclosed in Kinsman because it aids in providing hermetic sealing (For Example: See Column 6 Lines 38-41).

Additionally, since Wakabayashi and Kinsman are both from the same field of endeavor, the purpose disclosed by Kinsman would have been recognized in the pertinent art of Wakabayashi.

8. Claim 178 is rejected under 35 U.S.C. 103(a) as obvious over Wakabayashi et al. (U.S. Patent No. 6,607,970) in view of Kinsman et al. (U.S. Patent No. 6,717,245), Farnworth et al. (U.S. Patent No. 6,620,731) and Akram (U.S. Patent No. 6,544,821).

In regards to claim 178, Wakabayashi fails to disclose the following:

a) the second polymer layer comprises a photopolymer.

However, Akram discloses a semiconductor device that utilizes a photopolymer (For Example: See Column 7 Line 31). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to

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include a photopolymer layer as disclosed in Akram because it aids in protecting the device (For Example: See Column 7 Lines 31 and 32).

Additionally, since Wakabayashi and Akram are both from the same field of endeavor, the purpose disclosed by Akram would have been recognized in the pertinent art of Wakabayashi.

9. Claim 179 is rejected under 35 U.S.C. 103(a) as obvious over Wakabayashi et al. (U.S. Patent No. 6,607,970) in view of Kinsman et al. (U.S. Patent No. 6,717,245), Farnworth et al. (U.S. Patent No. 6,620,731) and Gilleo et al. (U.S. Patent No. 6,228,678).

In regards to claim 179, Wakabayashi fails to disclose the following:

a) the second polymer layer comprises a wafer level underfill.

However, Gilleo et al. ("Gilleo") discloses a semiconductor device that has underfill material (For Example: See Column 4 Lines 17 and 18). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include underfill as disclosed in Gilleo because it aids in minimizing thermal fatigue (For Example: See Column 1 Lines 60-66).

Additionally, since Wakabayashi and Gilleo are both from the same field of endeavor, the purpose disclosed by Gilleo would have been recognized in the pertinent art of Wakabayashi.

10. Claim 269 is rejected under 35 U.S.C. 103(a) as obvious over Wakabayashi et al. (U.S. Patent No. 6,607,970) in view of Kinsman et al. (U.S. Patent No. 6,717,245), Farnworth et al. (U.S. Patent No. 6,620,731) and Lin (U.S. Patent No. 5,436,203).

In regards to claim 269, Wakabayashi fails to disclose the following:

a) the thinned die is contained on a semiconductor wafer having a polymer support dam proximate to edges thereof.

However, Lin discloses a semiconductor device that has a polymer dam (40) (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include a polymer dam as disclosed in Lin because it aids in constraining the flow of the encapsulant (For Example: See Column 4 Lines 66-68).

Additionally, since Wakabayashi and Lin are both from the same field of endeavor, the purpose disclosed by Lin would have been recognized in the pertinent art of Wakabayashi.

11. Claim 271 is rejected under 35 U.S.C. 103(a) as obvious over Wakabayashi et al. (U.S. Patent No. 6,607,970) in view of Kinsman et al. (U.S. Patent No. 6,717,245), Farnworth et al. (U.S. Patent No. 6,620,731) and *Functional and Smart Materials* by Wang.

In regards to claim 271, Wakabayashi fails to disclose the following:

a) the first polymer layer comprises parylene.

However, Wang discloses a semiconductor device that has parylene (For Example: See 4.2.3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Wakabayashi to include parylene as disclosed in Wang because it aids in providing high reliability (For Example: See 4.2.3).

Additionally, since Wakabayashi and Wang are both from the same field of endeavor, the purpose disclosed by Wang would have been recognized in the pertinent art of Wakabayashi.

### ***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300 for regular and after final communications.

ML

November 9, 2006



M. Wilczewski  
Primary Examiner  
TC 2800